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(54) **APPARATUS FOR SEISMIC DATA ACQUISITION**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,297,982 A 1/1967 Allan
4,144,520 A 3/1979 McNeel

(Continued)

FOREIGN PATENT DOCUMENTS

GB 2 275 337 8/1994
GB 2275337 A 8/1994

(Continued)

OTHER PUBLICATIONS

Buttgenbach, Dr. Thomas, Schleisiek Klaus, "4-C System Goes Ultradeep," Hart's E&P, Houston, Texas/United States of America, Jan. 2002, 3 pages.

(Continued)

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(57) **ABSTRACT**

A seismic exploration method and unit comprised of continuous recording, self-contained wireless seismometer units or pods. The self-contained unit may include a tilt meter, a compass and a mechanically gimbaled clock platform. Upon retrieval, seismic data recorded by the unit can be extracted and the unit can be charged, tested, re-synchronized, and operation can be re-initiated without the need to open the unit's case. The unit may include an additional geophone to mechanically vibrate the unit to gauge the degree of coupling between the unit and the earth. The unit may correct seismic data for the effects of crystal aging arising from the clock. Deployment location of the unit may be determined tracking linear and angular acceleration from an initial position. The unit may utilize multiple geophones angularly oriented to one another in order to redundantly measure seismic activity in a particular plane.

49 Claims, 2 Drawing Sheets